

ACTIVITY: Why Volcanoes Form



Objective: Learners will understand the relationship between the mantle, movement of tectonic plates, the location of hotspots, and the formation of volcanoes.

Introduction: Volcanoes form at two primary locations: plate boundaries and hotspots. Understanding the motion of Earth's tectonic plates can help explain where active volcanoes are located and

Have learners:

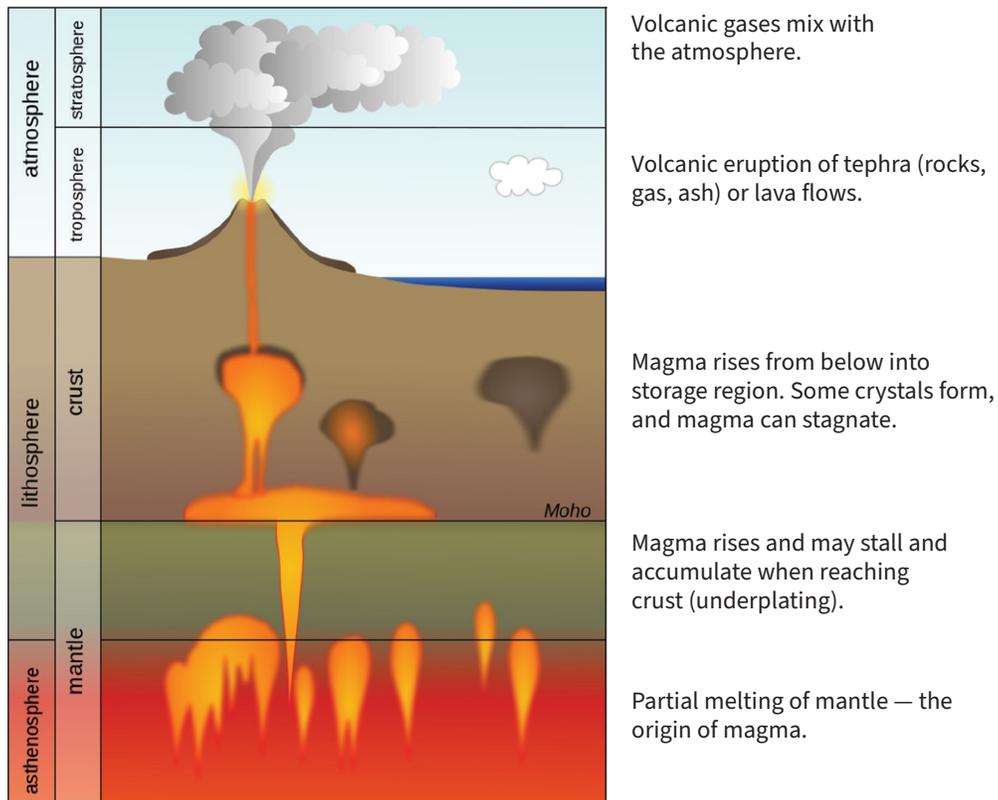
1. Read about the **layers of the Earth** and label the diagram.
2. Complete **an activity using a lava lamp to model how magma can rise to form a volcano**.
3. Add to the diagram to show how magma reaches the Earth's surface.
4. Learn about Plate Boundaries:
 - a. Read about **Earth's tectonic plates** to see that the outermost crust is broken into plates that move over the asthenosphere.
 - b. Highlight the plate boundaries where most volcanoes are located, then discuss:
 - ▶ *At which type(s) of boundary do volcanoes form? What is it about these boundaries that allows volcanoes to form?*
 - c. Explore a **park along a plate boundary**.
5. Learn about Hotspots:
 - a. Observe a **model of hot spot island formation**.
 - b. Use an **animation** to study the stages of volcanic islands formed by hotspots.
 - c. Use the diagram to explain why Hawaii is an island chain, not just one island.
6. Compare the map of the area under the western United States to the map of Hawaii.
 - ▶ *How are they similar? How are they different?*
 - ▶ *How can their similarities help determine the direction the plate is moving?*
 - a. Draw an arrow on the map to show the direction of plate movement.
 - ▶ *How does volcanic activity at a hotspot compare to activity at a plate boundary?*
 - ▶ *Is volcano formation at a hotspot more similar to volcano formation at divergent or convergent boundaries? Give evidence for your answer.*
 - b. Explore a **park at a hotspot**.

HANDOUT: Why Volcanoes Form



The diagram below shows three of Earth's layers as related to volcanic activity.

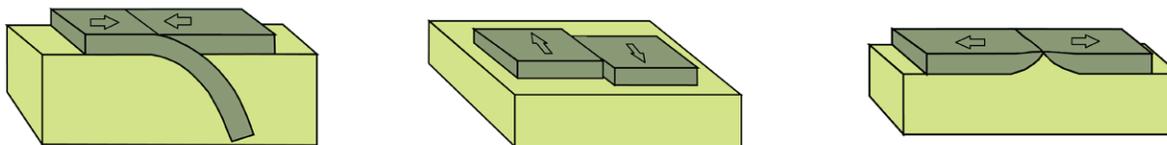
- ▶ Next to each layer, describe how each layer is involved in or affected by a volcanic eruption:



Modified from USGS

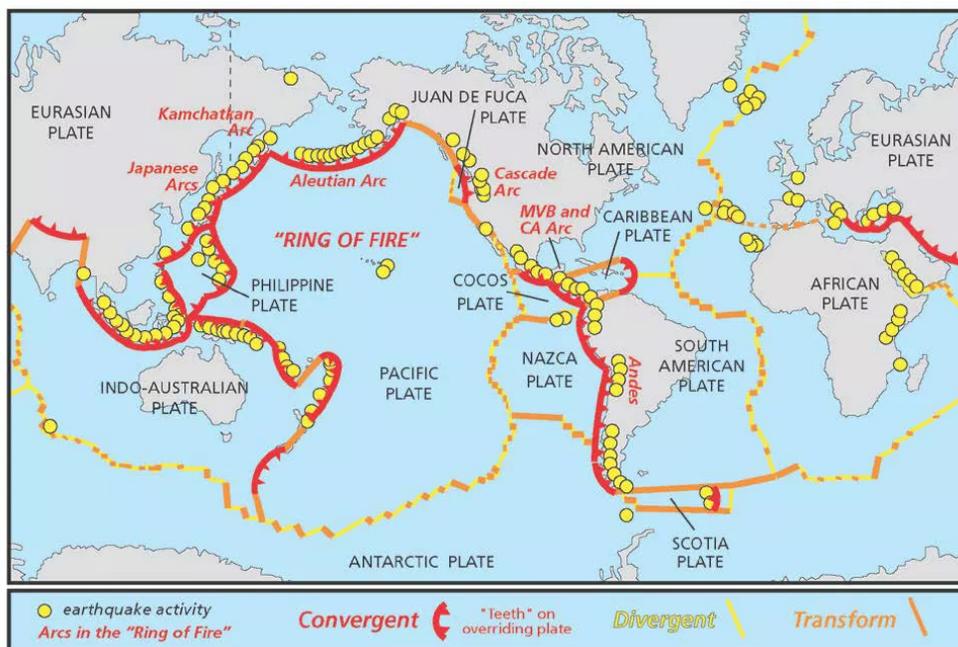
The diagrams below show three types of plate boundaries. The arrows show the direction of plate movement.

- ▶ Match the descriptions to the diagrams.
 - Convergent Boundary: where two tectonic plates collide.
 - Divergent Boundary: where two tectonic plates are moving away from each other.
 - Transform Boundary: where two tectonic plates move past each other.



Modified from NPS

Below is a map that shows the tectonic plates that Earth's crust is broken into. These plates are pushed in different directions by the mantle moving underneath them.

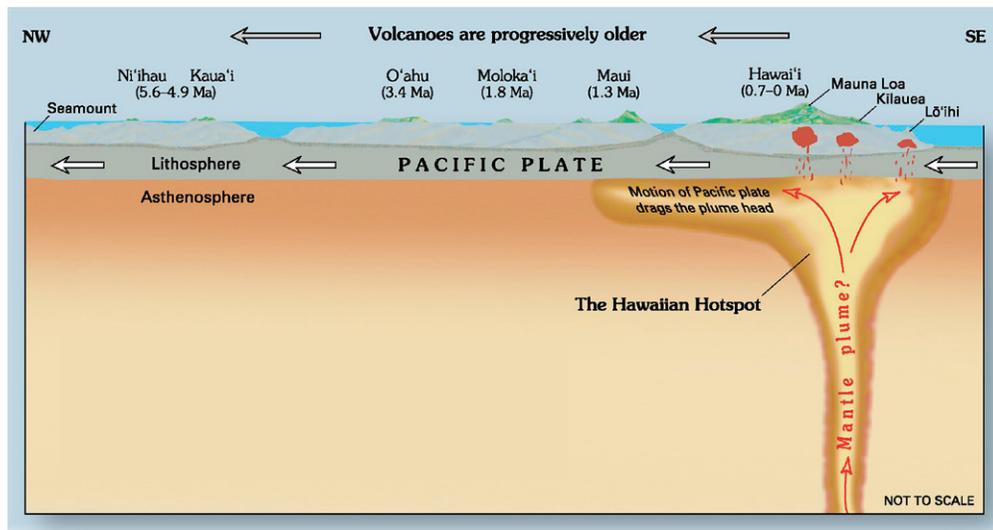


Credit: NPS

- ▶ Rank the three types of plate boundaries (convergent, divergent, and transform) by how often volcanoes are found along them: 1 — most volcanoes, 2 — some volcanoes, 3 — little to no volcanoes.
- ▶ Are there any volcanoes not on plate boundaries? How do you think they form?

The Hawaiian Islands are a chain of volcanoes not associated with a plate boundary. The following diagram shows how a hotspot—a mantle plume in the middle of a tectonic plate—releasing lava and creating volcanoes.

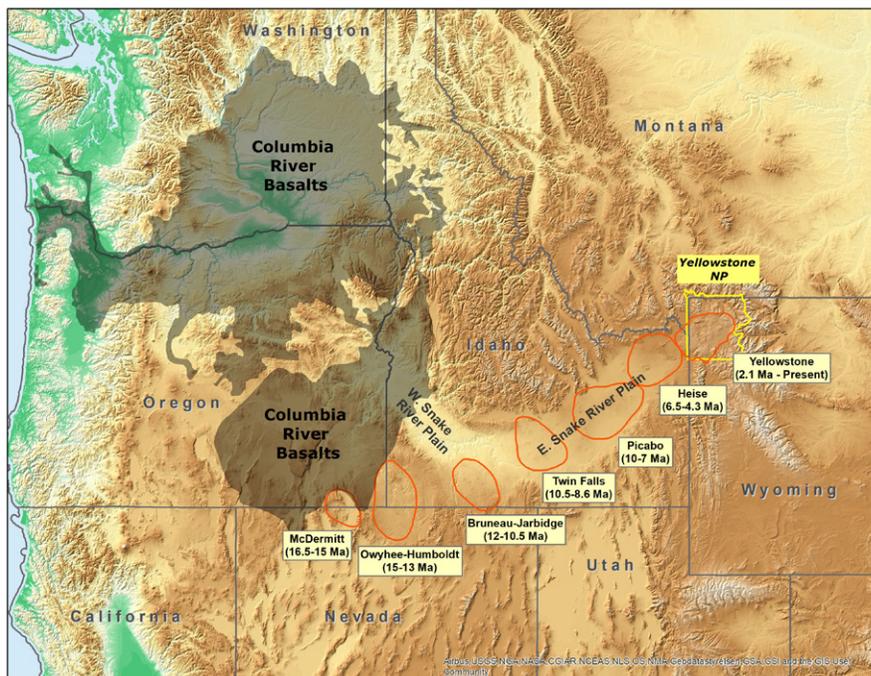
- Use the diagram below to explain why Hawaii is an island chain, not just one island.



Credit: Joel E. Robinson, USGS

A similar pattern has been identified in the Western continental United States.

- Given the information on the following map, draw an arrow to show the most likely direction of plate movement:



Credit: USGS